Statement of July 23, 1963

Mr. James E. Webb
Administrator

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

before the

Subcommittee on Retailing, Distribution,
and Marketing Practices
of the
Select Committee on Small Business
United States Senate

Mr. Chairman and Members of the Subcommittee:

1.

The hearings of this Committee on the relation of technological resources to the national economy go to the heart of one of the most important questions before the Nation at this time. The process of scientific discovery and its conversion to practical use touches every aspect of our national life; the wisdom with which we develop and use our scientific resources may well determine our ability to survive and prosper.

In detail, the exact relation of technological resources to the national economy is imperfectly understood. It is not difficult in certain areas to measure a direct and predominant effect of science and technology upon

economic growth. At the same time, mature study usually indicates that the final economic result is determined by an interaction between science and technology, on the one hand, and other economic factors, such as national resources or access to markets, on the other hand. We require more rigorous analysis of this process; I am glad to note that increased attention is being given to this problem by people in the universities; in the government, and in the private sector.

Whatever our limitations in understanding, however, events of recent years have produced general agreement that science and technology have become an indispensable element in the maintenance and growth of any modern economy. Technological resources now stand in importance with the traditional resources of land, labor and capital, and with such other factors as entrepreneurship and managerial capacity. Where technological resources are absent, or are not effectively organized and managed, then other types of economic resources will not be quickened to optimum effectiveness in the market place. To attempt to maintain a growing economy without the proper amount

of technological resources would be comparable, at an earlier time, to have attempted to enter fully into the industrial age without access to the basic resources of power and mineral ores. It is essential, therefore, that we seek to determine, if only approximately, the level of technological resources necessary for satisfactory growth of the American economy.

In seeking the answer to this problem, it is not possible to ignore the fact that the use of science and technology is required to sustain the desired position of the Nation in the world situation. The firm base of the national position, of course, is the maintenance of the strength of the national economy. Yet consideration must be given the immediate needs of the defense effort; of the exploration of space; of the pursuit of certain broad areas of science such as atomic energy; of the development of scientific resources among those who are or would be our friends and allies -- all these have claims upon our scientific and technological effort at any time.

As a Nation, therefore, we are confronted with the task of meeting a totality of needs in the short run with

available resources; and, in the long run, of creating those basic conditions in American life that will insure the maximum production of scientists, engineers, and technicians; the wise support of basic research; and the proper organization and management of these resources for both economic and national purposes.

In relative terms, we are confronting a new problem. It is only recently that science and technology have become so decisive in effect and large in quantity. In short, we are presently going through the rigorous process of incorporating a new, vital element into our national life, of creating those technological resources that will be capable of meeting any need of the future.

The accomplishment of this task requires response from all areas of our life. Our educational system is seriously involved. The development of scientists and engineers begins at least as early as the first grade. At the other end of the educational scale are our colleges and universities. We require more institutions of high quality distributed broadly over the Nation. There is needed in the universities an expansion of basic science training and research; at the same time, a stronger bridge

in the educational process must be built between the scientist who is advancing the frontier of knowledge and the engineer and manager of industrial production who must convert basic science into practical and economic application. This is a vital knuckle in the total process; as much as any single factor, advance here would increase the economic output of our existing and future technological resources. Without it, the effect of an increase in quantity of these resources will be seriously diminished. In the private sector, there is needed a thorough study of those factors that will increase and facilitate research, and that will translate research quickly into company policy and action. The record clearly indicates that in a number of broad industrial areas this process does not now operate effectively. We need to understand better the conditions under which science and technology can be made economically available to small as well as large enterprises. Similarly, we need to establish technological resources in those regions where they do not now exist. And we must take the steps necessary to make the great flood of scientific and

technical information more readily available to potential users.

2.

As an important part of this total process of building, using and incorporating technological resources into the national economy, NASA has heavy responsibilities. I would like to indicate briefly some of the ways in which we are attempting to meet these responsibilities.

While maintaining sufficient in-house competence to insure responsible management of the space effort, NASA spends approximately ninety cents of every dollar with private industry, thus encouraging the growth of research and development under private management.

NASA has examined carefully the employment in its program of scientists and engineers in relation to the needs of the total national economy. It is not felt that the space program is having a harmful effect by creating shortages of personnel. The best current estimates indicate that on January 1, 1963 the space effort occupied about 3.0 percent of the Nation's total of scientists and engineers; engaged in research and development. Current budget requests would raise these figures to about 4.9 and 10.0

percent, respectively. Closer study of the specific people involved indicates that there is a heavy concentration of space work in the aerospace industry. Current information indicates that, because of the ebb and flow of work in this industry, NASA contractors have been, and will be, able to perform NASA work without significant new drain on the Nation's scientific and engineering resources.

NASA has a vigorous program of making available to the private sector the scientific advances and technical innovations growing out of the space effort. This is particularly important in the NASA program because of several factors. First, the NASA program of research ranges across virtually every area of interest from anatomy to electronics to the effects of zero-gravity. For this reason, it is especially relevant to the needs of civilian research and production. Second, the requirements of space are harsh; as a result, the greater part of the work carried on by NASA is at the leading edge of the state-of-the-art, and quite often requires advance in the state-of-the-art. For this reason it is rather the rule than the exception that some advance, either in product or in general technological skill, is found in the NASA

program. Third, a major part of the NASA effort is involved in the organization of large research and development programs, programs that involve both large and small contractors and suppliers and which require a high level of reliability of component parts and of the system as a whole. Increasingly, this kind of activity is becoming characteristic of civilian production, and the capability to establish and integrate these kinds of large enterprises is in itself an advance in the application of technology. This is of special relevance to this Committee in view of the fact that the survival of small business concerns may in part depend on the ability of the main producer to organize and use efficiently and effectively the products of large numbers of small concerns.

At NASA, the effort to make available the results of its science and technology is divided into two parts. The first part, housed in the Office of Scientific and Technical Information, is designed to collect, to abstract, to index, to store on tape and otherwise, and to disseminate all scientific and technical information relative to space exploration. These materials are

available not only to NASA and its prime contractors, but are available through publication and otherwise to the scientific community and the general public.

A special part of the total job of disseminating rapidly the results of the NASA research and development effort is that of identifying as quickly as possible those elements of this effort that seem to have applications for civilian use. Within NASA the Office of Technology Utilization has been established to work at this problem. In each of the NASA Field Centers there are technically trained people who monitor and study the research programs being carried on at the Centers in order to make initial identification of potential items of transfer. These items are then described and sent to Headquarters. At Headquarters, a staff of technical people, aided by a number of research institutes, continue the evaluation and analysis of these items. When evaluated and described, these items of potential transfer are disseminated in a variety of ways. In addition to the normal channels of publication on a national basis, NASA is seeking ways to begin to establish information centers and sources of

knowledge about items of potential transfer of places more convenient to the average industrialist and businessman. Thus, for instance, the Midwest Research Institute for over a year has been carrying on a program of helping to identify items for transfer, and of going about in a six-state midwestern region to talk to business and industrial leaders in a number of cities. In this way, we are attempting to both speed up the process and make it more realistic in terms of the needs of the average business and industrial concern.

In addition, NASA, as a part of its University Program which will be referred to later, has enlisted the help of a number of universities in solving this problem of disseminating scientific and technical information, and, especially, of working at the problem of the transfer of the results of research and development to civilian use in as quick and as practicable way as possible.

There is no question but what it is essential to make a breakthrough in this area. The research and development program of the government, as exotic as some of it is, represents a great storehouse of new scientific and technical information and advance. It

is a national resource, bought and paid for by the public generally, and it must be put to civilian use quickly and efficiently.

NASA draws heavily upon the scientific resources of the universities. Within the limits of its charter, NASA is doing all that is possible to strengthen the Nation's basic university resources. In this respect, NASA in its project work, seeks to place its work in the essential departmental structure of the universities wherever possible, and to couple it with graduate training and research. In regard to the latter point, NASA has begun a graduate training program of support for good graduate students. At the present time, training grants have been made to 886 students in 88 different universities. A feature of these grants is the fact that they are made to the institution, to be awarded by the faculty for work at their institution. In this way resources are built in those universities that are seeking to advance their standing, rather than have perhaps the majority of these graduate students take their grants to a small group of leading universities. At a number of universities where a large amount of project work is being carried on,

NASA has made grants in support of facilities, and in support of general work in areas that are related to the space effort. It is in terms of these grants that NASA is asking these universities to take a special interest in the matter of making available to their regional environments the vast amount of scientific and technical information growing out of the NASA program. Special emphasis is placed upon bringing items of potential civilian use directly to the attention of industrial and business concerns of the area.

3.

I have thus indicated some of the ways in which NASA is seeking to discharge its responsibilities in the area of interest with which this Committee is concerned. The solution of the problem of effectively relating technological resources to the growth of the national economy must inevitably involve a total approach by all elements of our national life.

Mrs. Eurich:

If you have any more of the July 23, 1963, statement - per attached - please destroy. The July 23 statement was substituted by the one dated December 18, 1963.

Rita
12/30/63